5-3-2005

An exploration of the impact of working individually versus working collectively on stress and performance

Shari L. Satow
Rowan University

AN EXPLORATION OF THE IMPACT OF WORKING INDIVIDUALLY VERSUS WORKING COLLECTIVELY ON STRESS AND PERFORMANCE

by
Shari L. Satow

A Thesis

Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
of
The Graduate School
at
Rowan University
April 22, 2005

Approved by
Dr. John Klanderman & Dr. Roberta Dihoff

Date Approved 5/3/05

ABSTRACT

Shari L. Satow
AN EXPLORATION OF THE IMPACT OF WORKING INDIVIDUALLY VERSUS WORKING COLLECTIVELY ON STRESS AND PERFORMANCE
2004/2005
Dr. John Klanderman & Dr. Roberta Dihoff
Master of Arts in School Psychology

The purpose of the present study was to examine the impact of working alone versus working with others on stress and performance. Gender was also looked at as a variable affecting stress and performance as well. The Block by Block design, a building game consisting of seven different shaped blocks, was used in order to assess the ninety-five participants (23 male & 72 female) recruited from a medium sized university in southern New Jersey. Subjects were assigned to work either alone or with others in recreating specific images using the blocks, and were then asked to report their performance and individual stress. Analysis using the Mann-Whitney test revealed a significant effect found on performance by subject grouping.

TABLE OF CONTENTS

Chapter 1: The Problem

Need

It's evident from listening to past generations, or just by looking around oneself, that the system of education in this country has made tremendous improvements in the resources it is able to offer students in today's society. The availability of quality education to numerous populations has become much more widespread. The creation of the Internet has put almost too many resources at our disposal.

These advancements in offerings do not come without a price. With increased resources come increased expectations for performance, and various positions such as administrators, teachers, and ultimately students feel this load. New legislation, such as the No Child Left Behind Act, is an example of how the ever-changing system of education can have very serious impacts on multiple levels. Requirements of Adequate Yearly Progress and accountability for results place intense amounts of pressure on student performance as well as those responsible for their development. In order to obtain this optimal achievement, it seems clear that students cannot be made to feel the burden present. Students should be in an environment where they are encouraged to explore and achieve their best possible, but should not have to feel the burden of legislation hindering that. As modern society has increasingly more and more stressors, it is important that learning be in a minimal anxiety environment where students can focus on optimal learning. While the system of education has made leaps and bounds in its standards and what it is able to offer, it has become so busy measuring performance

that the performance itself is becoming an oversight. It is imperative that we look at the practices involved in education to determine how the process is best achieved.

Though our society as a whole tends to place more emphasis on individual accomplishments, it seems that the best things are achieved when we work together towards a common goal. Human nature invites communal participation in activities, while at the same time impeding it by society measuring individual actions. The instinct to get involved becomes overwhelmed by the task falling into a single person's hands. In collaborative efforts, represented in conditions as extreme as natural disasters relief down to school fundraisers, the possibilities achievable are evident when people come together to accomplish something. When the opportunity to exert collaborative efforts are presented in the classroom, it is thought that results (meanings) of efforts will be more salient and lasting while occurring in this integrated, shared space.

Purpose

The purpose of this study is to examine the dynamics among individuals in cooperative efforts. Determining the impact various environments—from operating on your own to working collaboratively—have on individual emotion and productivity could influence the type of environment we try to recreate to achieve desired outcomes. This particular study will focus on the role of stress among individual students versus student group efforts to achieve a common goal at the collegiate level. It is believed that team based activities will help reduce feelings of stress as a result of the necessary cooperation. With the onus distributed, participants should be freer to focus on the task at hand, and not the pressure to get the job done. This, in turn, will result in a more efficient, meaningful experience.

Theory

Anxiety is a natural defense mechanism that our body initiates in an attempt to protect us from some perceived trouble. The trouble is, sometimes that switch becomes loose and turns itself on unnecessarily. While anxiety of a stranger in a dark alley can alert us to be wary of a potential danger, anxiety of competition in a classroom could interfere with the learning process as we focus on our fears.

When something externally is perceived as a threat by the senses, a spark ignites in the brain that is the catalyst to a series of changes in brain chemicals and hormones. This begins in the amygdala, the emotional core of the brain, which when presented with certain stimuli sends out signals to other structures in the brain to be on alert. This response to stress in the physical world is what puts the body in anxiety mode (Gorman, 2002).

Stress is a common, often unwelcome emotion felt when threatening external stimuli are present in one's life. Though almost always present to some extent, the effects of stress, predecessor of anxiety, are not always known. In looking at the reactions of individuals to stress, research indicates that its presence results in a change in focus of attention from a broader to a narrower perspective. While this restricted focus could be thought to benefit the individual by allowing them to direct their attention where necessary, we also see that along with attentional focus, level of thought processing is restricted. With wavering attention and inadequate reasoning, one is able to see how performance would be affected. The attentional theory approach touted by Baumeister and colleagues reveals that pressure to perform results in further self-awareness, and acts

as a distraction from what is taking place in one's surroundings and the specifics necessary to accomplish the task at hand (Driskell & Salas, 1999).

With attention as a key component in the learning process, it becomes evident that environmental pressures impact the level of attention we are able to maintain. Though research has shown how stress impacts behavior and functioning, questions remain regarding what behavior and environmental settings help to reduce stress and prevent anxiety from commencing in a classroom setting. Further research is necessary to determine such practices.

Definitions

Group efforts—This refers to two or more individuals working toward a common goal. Cooperative attempts allow completion/accomplishment of the tasks at hand.

Stress—An emotion felt in the body when something external is perceived as threatening.

Anxiety—The powerful, often debilitating, apprehension associated with a certain task or subject when stress has been repeatedly present.

Assumptions

All subjects are expected to engage in the activity, whether they are working alone or with others. It is assumed that people presented with a task inviting cooperative participation will each play an active role in its completion, and not delegate it to one person amongst the group. The task at hand is assumed within the competency level of the participants.

Limitations

One limitation is the age of subjects participating in the study. One can be a student in a classroom at almost any age, and support that group efforts versus individual efforts reduce anxiety among college students may not apply to other populations. Most people in the United States begin their formal education at a young age, and it is questionable whether practices implemented among 25 year olds would pertain to those at five.

Another limitation is that the variations in group activities is numerous. The limited setting examined may act to limit generalizability of cooperative efforts as helping to reduce anxiety outside the arena examined. Group efforts outside a school system may have more or less of a competition factor inherent to them. This change in dynamics may alter the results found, indicating that group efforts may help to reduce feelings of anxiety in the realm of education, but not necessarily in the business world.

Summary

In Chapter 1, the need, purpose and theory call for a reevaluation of the implementation of education in the United States to determine the most effective and beneficial practices in the learning environment. Chapter 2 will provide a review of the research currently available regarding cooperative and collaborative learning and the role of anxiety. Chapters 3 and 4 will detail the design of the related study and the data it provides. To conclude, Chapter 5 will discuss the findings and the suggestions they allow for future strategies in education.

Chapter 2: Review of Research

This review of research presents information currently available on how the arrangement of conditions in one's environment affects individual performance, and how changes in individual reactions occur with changes to environmental organization. Beginning in 1898 human interaction was recognized as a factor in task performance. It was at this time that Tripplett questioned how the presence of others was able to influence the actions of individuals through the "together" and "apart" design he employed in his studies. This set the stage for studies to follow by numerous researchers, with variable results as to the positive or negative stimulation of subjects while in the presence of others (Hare, 1976). Two terms came about as a result of the various studies executed: social facilitation and social loafing (also known as the Ringelmann effect). Social facilitation represents the concept supported by Tripplett, which stated that the presence of others has a positive effect on individual performance. Social loafing, on the other hand, supports that although group performance generally exceeds that of an individual, it does not necessarily represent the best of the group's ability (Wheelan, 1994). While the phenomena looked at in these contradictory investigations impact many areas in the broad range of social psychology, it is relevant for this study to examine task performance and how it is influenced in instructional situations.

In looking at the factors involved in task performance, there are generally three types of structures manifested in instructional settings: cooperative, competitive and individualistic. Cooperative conditions occur when individuals work together towards a

common goal. Though competitive conditions at first seem similar in that individuals are also working towards a common goal, the difference is realized when the goal is obtained. In a competitive setting goal achievement by an individual denotes disappointment for others, whereas in a cooperative setting when the goal is achieved by one, it is achieved by all. In individualistic situations, on the other hand, the goals of individuals are unrelated to each other (Deutsch, 1962; Johnson & Johnson, 1975). The following research will consider the merits of individual versus overall group performance, participation in a competitive versus cooperative setting, as well as the role of stress in an individual when in various arenas. Stress, as an inborn response to changes in the environment one is in, warrants inspection as to how perceived high-demand, high-threat situations affect performance (Salas, Driskell & Hughes, 1996). The research presented will set the stage for the present study as well as influence its design.

Stress

In any attempt to measure the effect of stress, it is necessary first to understand the term and define the concept. As stress is not a tangible object which can be seen or handled, it is sometimes difficult to determine its meaning. Stress is a psychological concept far reaching in its perceived effects. According to Hansen and Sullivan (2003), there are three major components of stress. The first is the stressor, a single or repeated incident occurring in one's environment. Examples of stressors could range from a loud bang, to time pressure, to a troubled relationship. Stressors such as these lead to the second element, referred to as strain. Strain represents the psychological and physiological effects that result from the stressor. This ingredient of the formula for stress is the commonly recognized definition of the term. There is, however, another key

component involved called appraisal. Appraisal denotes the process of assessing the degree of threat of a stressor and an individual's ability to deal with it. Zegans (1982) defines a fourth implied piece of Hansen and Sullivan's stressful experience, which is the implementation of a single or multiple strategies to handle the stressor. These strategies could be engaged just the once, or used on an extended basis (Jewett & Peterson, 2004).

The taxonomy of stressors developed by Elliot and Eiseldorfer (1982) is useful in differentiating the various roots from which stressors may stem. While overall this system divides stressors according to duration and course, there are five categories in which they fall. These are acute time-limited stressors, brief naturalistic stressors, stressful event sequences, chronic stressors and distant stressors. For the purpose of this study, the focus will be on acute time-limited stressors, or those that involve tackling demanding things such as a giving a presentation, and brief naturalistic stressors, which imply a real-life short-term challenge such as classroom activities. The remaining stressors deal with more enduring incidents which would be handled in different manners than the acute time-limited and brief naturalistic stressors which pass without delay (Segerstrom & Miller, 2004).

The impact of stress is vast across situation and effect. There are many perceived applications of stress in daily routine, and while some can be thought of as beneficial, the term generally carries a negative connotation. Some of the injurious consequences seen are physiological changes such as increased heartbeat, labored breathing, and trembling (Rachman, 1983); emotional reactions such as fear, anxiety, frustration (Driskell & Salas, 1991), and motivational losses (Innes & Allnutt, 1967). Cognitive effects such as narrowed attention (Combs & Taylor, 1952; Easterbrook, 1959), degraded problem

solving (Yamamoto, 1984), and performance rigidity (Staw, Sandelands, & Dutton, 1981) become evident as well as changes in social behavior such as loss of team perspective (Driskell, Salas, 1999) and decrease in prosocial behaviors such as helping (Mathews & Canon, 1975). There has even been lowered immunity to disease demonstrated (Jemmott & Locke, 1984).

Reactions such as physiological changes represent an adaptive response to environmental threats in order to support fight or flight behavior. Such response, however, is not always necessary, and the resulting physical consequences experienced without need may eventually take their toll. An example of this is seen in the immune system, which has been recognized as interconnected with other systems in the body such as the nervous system and endocrine system. This relationship has been documented, as responses from the nervous system and endocrine system to environmental events have been shown to produce reactions from the immune system as well (Segerstrom & Miller 2004). Increases in stressful life events have been shown to be associated with anxiety and depression, and as a predictor of suicidal ideation and hopelessness. Overall there has been a positive correlation between level of stress and behavior patterns which compromise health (Deckro, Ballinger, Hoyt, Wilcher, Dusek et al., 2002).

There is also a distinction to be made between the male and female response to stress. A major gender difference in response to stress is the display in emotion among men versus women. Whereas males generally externalize their emotions, seeming much more vocal in their responses to stress, women's responses seem more subdued as they internalize their feelings (Benenson, Maiese, Dolensky, Dolensky, Sinclair et al., 2002; Bowlby, 1969; Turner, 1991). The contextual model illustrated by Sameroff (2000)

attributes response differences such as these not to the personalities of the individuals, but to the environments which they are in. A gender difference has been shown starting after five years of age in the group size to which males and females belong, with males interacting with several people at a time, as opposed to females normally with one. Several studies have shown that group versus individual relationships influence behavioral responses in both men and women, and groups of three or more show lower levels of tension than do individuals or dyads (Benenson et al., 2002).

Learning through individual vs. group participation

Research dating back to 1932 shows the advantage of group over individual problem-solving, with the investigated groups displaying abilities to produce more solutions not only in number, but quality as well (Georgas, 1984). With findings such as these, the question arises as to what the origins of these differences in task performance could be. Increased active participation of individuals when participating in group activity and perception of social support appear to be two of the main factors involved. Karasek and Theorell (1990) observed that an individual's ability to involve themselves in decisions regarding work conditions (i.e. through working in groups and class discussions) provided a key resource to those dealing with stress-provoking demands. There is a certain level of support perceived by individuals from both peers and teachers which increases as one participates in group work. Though this participation revealed inconsistent effects in reducing the stress of individuals, the reverse effect was seen where there was a marked increase in stress among those involved in independent work (Natvig, Albrektsen & Qvarnstrom 2003).

Group study has been shown to improve social skills, strengthen confidence of students, and allow students a forum to practice assertiveness (Engleberg & Wynn, 2000; Petress, 2004). Having to substantiate what students know or believe to members of the group acts to lessen stress related to assessments by reducing self doubt about what they know (Petress, 2004). Learning in the group setting becomes a makeover in collective information and skill rooted in the relationship of each team member's individual experiences. It becomes evident how the sharing process inherent in group work thrives on the involvement of group members, as the diversity in thoughts presented benefits individuals from the diverse applications which must then be employed (Ellis, Hollenbeck, Ilgen, Porter, West & Moon, 2003; Hinsz, Tindale & Vollrath, 1997).

In recognizing the benefits of group study, it is necessary to look at the systems involved in learning. Models such as the information-processing theory recognize certain steps involved in the acquisition of new knowledge. In order to learn one must go through the processes of attending to, encoding, storing, and retrieving information presented in one's surroundings (Hinsz et al., 1997; Ellis et al., 2003). In their attentional theory approach, Baumeister and colleagues focus on this first aspect of the learning process in declaring that the capacity to maintain attentional focus is an exceedingly important part of the learning method. This theory claims that stressors, such as performance pressure, act to confine focus within an individual. The resulting narrowing of attention acts a distractor from new material being presented, and therefore new information to be stored (Baumeister, 1984; Butler & Baumeister, 1998). The present study looks to these two theories for an explanation as to how individuals become better

connected through the interaction of group work, thereby allowing less pressure and greater focus.

Learning through competitive vs. cooperative participation

Looking at group versus individualistic structures of learning necessitates investigation of another system of organization involved in tasks: competitive versus cooperative task settings. The cooperative setting implies joint effort of some sort among two or more people. In this situation there could be reward incentive given for task performance, however this is something to be bestowed upon the entire group for their mutual actions. Competitive settings, on the other hand, typically give reward incentive for individuals performing alone while working towards recognition of their individual accomplishments. In comparison of the two different dynamics, research has repeatedly shown that student achievement and performance outcomes are greater in cooperative learning methods over competitive ones (Ellison & Boykin, 1994; Slavin, 1983b; Nastasi & Clements, 1991).

Though common thought once stated that competition was the only way to inspire student achievement, research has shown otherwise. In a study by Johnson, Skon, and Johnson (1980), cooperation was shown to promote higher achievement on conceptual problem-solving tasks due to three major variables influential to the quality of the problem solving. These were:

1) The development of superior cognitive problem-solving strategies
2) The medium and low ability students benefiting from their interaction with the high ability students without the opposite occurring, and

3) The incentive for achievement being increased by peer support and encouragement for learning.

Students in this study displayed higher post-test scores on reasoning, categorization and achievement than those operating individually or in competitive teams. The difference in approach distinguished between a competitive and a cooperative work group is dubbed "discuss what I do not understand"(Vernette, Harper & DiMillo, 2004). In this difference shown in the cooperative situation, high ability students are able to maintain their proficiency while aiding those of lower ability to evaluate their thoughts and benefit from the peer response of high ability students. Though functioning in cooperative groups can be more time consuming, the result is a product containing less errors and better understanding (Georgas 1984).

What makes a cooperative team successful? Though cooperative learning has generally been thought of and proven as a successful strategy for older students, Vernette et al. (2004) showed that students of all ages benefit from working this way, even at the beginning stages of their education. Their work with children from four to eight years old displayed that even at this young age, students learned more and developed a better understanding of material when working cooperatively. Petress (2004) defines the key elements of successful group involvement, which are normally five members or less, as "a sharing of: ideas, personal and collective time management, and task preparation; cooperation amongst group members; collective responsibility for the group task and for each other's welfare; and a willingness to be an active group participant." Success requires members to have the appropriate mindset in their efforts that "the social dimension is not the group goal, but the means to task accomplishment". A distinction

should be made between competitive and cooperative tasks in the acknowledgement of students in cooperative efforts that success is determined by the efforts of each team member, rather than their abilities (Chambers & Abrami, 1991).

Summary

Though a little competition is generally thought to be a healthy incentive to accomplish a task, it is necessary to take a second look at what is really achieved, as well as what is sacrificed, when acting in such a manner. Competition emphasizes individual abilities and rewards their accomplishments. While the contributions of individuals is very valued in the individualistic society of the United States, such behavior does not always equate to being the most advantageous overall. It has been shown that working cooperatively with others towards a common goal results in a more efficient and effective product. Not only is the outcome of such situations better products created by the group overall, but an improvement in the state of individuals as they benefit from the interaction with others. The advantage revealed is a superior group made up of more competent, secure individuals.

While the difference in reaction to stress in the two situations has not been fully investigated, the acknowledgement of diminished tension in group settings indicates that the reduction in stress when participating in such manners could be a factor in the increased success of group work. Given the harmful potential of persistent stressful reactions to both the body and the mind, the role of stress and how it can be lessened must be considered. The current study will be conducted to explore the differences in stressful reactions according to different learning conditions.

Chapter 3: Design of Study

Sample

This study was carried out using undergraduate students at a medium size public university in southern New Jersey. Ninety-five students (23 males and 72 females) were recruited either from upper-level psychology classes where the study took place, or through the subject test pool at the university. The study was administered in a classroom setting for subjects from both the test pool and the psychology classes. Subjects were mixed in gender, race, and ethnicity and typically fell between the ages of 18-22, however three subjects were older at the ages of 23, 29 and 44.

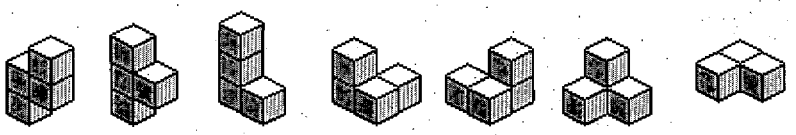
Design of Study

Upon entering the classroom where the study took place, subjects were called to the administrator's attention. It was presented that the intent was for each subject to work individually, however lack of adequate supplies required some to work collectively. Subjects were then assigned to work either individually or with others in order to accomplish the "Block by Block Creative Building Game." Given that the Block by Block game was a commercial product sold in stores, there were no measures of reliability and validity applicable for the nature of this study. The rationale in choosing the given tool was that it would provide a concrete means of measuring performance, it was not specific as an individual or collaborative group activity, and could be administered in the classroom setting where the study took place.

The Block by Block game, distributed by ThinkFun, was marketed as appropriate for ages eight to adult. Originally known as the Soma Cube, it was conceived of in 1936 by Piet Hein during a lecture he attended on quantum physics. It was at this time that Hein thought of the geometrical theorem that produced the Soma Cube, which consisted of seven pieces that make up all the non-convex shapes that can be made by combining four or fewer three-dimensional cubes together (see Figure 3.1). Traditionally used as recreational activity, the Soma Cube became a very popular puzzle in the 1970s (Eggermont, 1997; Block by Block, 1998).

The same seven pieces of the Soma Cube were included in the Block by Block Creative Building Game version, along with a deck of 60 cards which provided different shapes that could be created using the puzzle pieces (see Appendix 1). The back of each card provided hints that the subjects were permitted to use (see Appendix 2), however they were asked to continue working on each card until they were able to accurately represent the image shown, and continue in that manner through as many representations as they were able to recreate. At the end of a 15-minute period, performance was measured by the number of cards that subjects were able to successfully reconstruct using the blocks. Subjects were then asked to complete a form detailing how many cards they were able to accurately replicate with the blocks, how many people they worked with in completing the task, and how they would rate their individual levels of stress on a scale of 1-10 (1= no stress, 10= extreme stress).

Figure 3.1—Seven Soma pieces used in the Block by Block Creative Building Game



Hypothesis

It was hypothesized that subjects working on the Block by Block task cooperatively would experience lower levels of stress than those acting individually.

It was also believed that those working on the task as a group would display better performance than those working alone.

Lastly, it was believed that gender would impact the level of performance and stress exhibited.

Analysis

The statistical analysis used was the Mann-Whitney test due to the ordinal form in which stress was measured. The tests were run to look at performance scores and stress levels by subject grouping (working individually versus working with others) and by gender.

Summary

Two groups of participants: 1) those working individually, and 2) those working in conjunction with a group of their peers were employed in order to complete the Block by Block Creative Building Game task of the given study. All subjects were students attending a public university in southern New Jersey where the study took place. Following a 15-minute test period, participants reported their subject grouping and levels

of performance and stress in order to complete the current study which examined if participating in individual versus group work had an impact on stress and performance.

Chapter 4: Results

The subjects who participated in this study reported stress levels on the full range from 1 (no stress) to 10 (extreme stress). When broken down by gender female stress levels ranged from 1-10, while males reported stress levels from 1-9. Performance scores ranged from 0-8 (see Table 4.1). Both male and female subjects obtained scores of zero, but the top female score was seven.

Table 4.1—Descriptive statistics of performance by subject

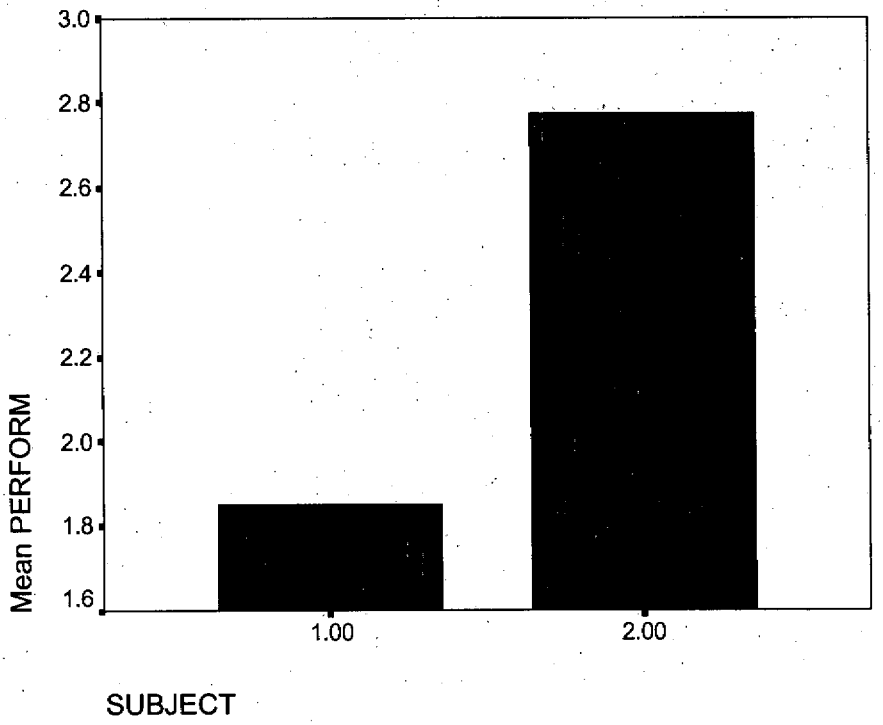
Subject group	Gender	Mean	Std. Deviation	N
Individual	Female	1.5625	1.60518	32
	Male	2.4667	2.44560	15
	Total	1.8511	1.93344	47
With others	Female	2.7500	0.95407	40
	Male	2.8750	0.83452	8
	Total	2.7708	0.92804	48
Total	Female	2.2222	1.40645	72
	Male	2.6087	2.01673	23
	Total	2.3158	1.57280	95

While the results of the hypotheses of this study varied in the significance of their effects, the following was found in response to the speculations previously stated: No significant results were seen regarding the hypothesis that 1) subjects working cooperatively would experience lower levels of stress than those acting individually, or that 2) gender would impact the level of performance and stress exhibited.

The belief that those working on the task as a group would display better performance than those working alone, however, did prove to be highly significant, with

the Mann-Whitney test revealing significance at the .0001 level, and a Z of –4.075 (see Figure 4.1).

Figure 4.1



Chapter 5: Summary

Education is the key to advancement for an individual and a culture as a whole. The more we know and understand, the better we function as human beings. It was the intent of the present study to gain a better understanding of the ways in which optimal learning takes place as an attempt to help improve the implementation of techniques for those administering the education process, as well as to enhance the education process for those taking part in it.

Discussion

Research has shown how stress can play both a positive and negative role in our daily functioning, yet its exact impact seems varied and inconsistent. Stress, being an intangible variable, can have a great effect that is difficult to measure. Though we can distinguish among the ways in which stress impacts, as in the focus of this study on acute time-limited and brief naturalistic stressors, its restriction as a psychological concept limits its comprehension. While the present study did not find that an individualistic or cooperative structure played a considerable role in the feeling or management of perceived stress, the psychological component of the variable limits the conclusiveness of such a finding.

Something more manageable in actuality is the structure of instruction and exercise in education. Though the difficulty in measuring and therefore managing stress became evident through looking at past research, the structure of a classroom setting is more easily controlled. This became a question and consideration as to how the differing

structures within the classroom of operating individually or cooperatively would impact performance and the perceived levels of stress among the individuals at work. Referring to the work of Johnson, Skon and Johnson (1980), there are three influential variables to be remembered which contribute to cooperative learning arrangements: 1) the development of superior cognitive problem-solving strategies; 2) the benefit for those of lower abilities to interact with higher-ability students, without the opposite occurring; and 3) the increased incentive for achievement with peer support and encouragement for learning. These factors seem to be well at work given the highly significant findings that performance levels increased when subjects worked cooperatively.

Certain unexpected elements may have been at play in the collecting of the current research, and these may have had an impact that is unaccounted for in the results. One factor to be recognized was that subjects were recruited to some extent from different environments, which therefore altered slightly the atmosphere they participated in. Though the actual physical setting of the study took place in the same building on the campus of the university for each participant, there were two possible roots from which the subjects came. Forty-four of the ninety-five subjects were taken from two upper level psychology classes. These students took part in the study in the same room in which they normally had class and were accustomed to working together from previous experiences. In the other situation, subjects registered to partake in the study based on the need to fulfill research requirements for introductory psychology classes at the university. These participants had not necessarily been exposed to each other or the space they were in during the study. Through administration of the two different groups it became evident that the mentality of the subjects differed, although the exact difference that existed could

not necessarily be defined. It seemed, however, that there was more camaraderie among those who attended class together as could be seen through efforts to work with a partner when assigned to work individually, as well as commiseration among class members as to how difficult the task was. This was a marked difference from participants in the subject pool who came into the room and barely spoke during and surrounding the testing period.

Questions also arose surrounding the difficulty level of the Block by Block game. Though endorsed as being appropriate for ages eight to adult, the predominantly eighteen to twenty-two year old subjects of this study seemed to struggle in completing the game cards. While those who participated from the subject pool did not vocalize their discontent as the upper level students did, it does not necessarily imply that the discontent could be discounted on their part. Body language and facial cues, along with performance level itself, revealed that some difficulty was experienced. Given the marketed ages, in combination with the permission to utilize the hints provided on the backside of each card, this was unexpected.

Implications for further research

While the present research supports the cooperative structure of learning among older students, it does not answer the question as to the impact of this strategy on younger children. The cognitive, social, and physical functioning of children in preschool, elementary or middle school is so varied from college age students. Given the level of existing support for such practices through the present and past studies, further research would be merited to see if cooperative learning strategies apply at a range of age levels, rather than just the college age examined. Also of interest could be examining the way

stress and performance change with cooperative versus individualistic task involvement across an individual over time, rather than across age cohorts.

Another question arises regarding the gender variable. While findings here did not support gender as a significant variable regarding stress and performance, past research does show that the manifestation and interpretation of stress varies between males and females (Benenson et al., 2002; Sameroff, 2000). It might be beneficial to do single sex studies where the interaction of mixed genders could not be seen as a possible impact, or on the flipside, where the congregation of males or females alone might indeed act to influence gender specific responses. Outcomes could then be attributed as inherent to the male or female operation to see if this impacts the effects of stress and/or performance differently.

Though stress was not supported as a factor in this process, it is the belief of the experimenter that it should not necessarily be eliminated from consideration. Given the vague nature of stress it is not clear what elicits this feeling among individuals, and more research could be done with increasing levels of consequences that may perhaps be more relevant to the subject. It might be beneficial to conduct the present study during actual classroom activities, rather than the simulated style of the present study, in order to present a more weighted experience for the subject. This should be carefully executed, however, given the comfort level found in the subjects in the present study participating in class. Further research could also be done in regards to the different types of stressors that exist among the taxonomy defined by Eliot and Eiseldorf (1982).

Conclusions

The current study explored the impact of working individually versus working collectively on stress and performance, and was able to determine a significant finding based on the research collected. Though stress was not shown to be directly influenced by the working environment, this impact was seen in terms of performance levels. In spite of the limitations which existed in the investigation and the array of studies that ought to be done in the future, the research supports that educators would be well suited to incorporate cooperative learning strategies into their teaching styles during instructional periods. The marked increase in performance among those working with others reveals that the process is beneficial and should be utilized.

REFERENCES

Baumeister, R.F. (1984). Choking under pressure: Self-consciousness and paradoxical effects of incentives on skilled performance. *Journal of Personality and Social Psychology, 46,* 610-620.

Benenson, J.F., Maiese, R., Dolensky, E., Dolensky, N., Sinclair, N., & Simpson, A. (2002). Group size regulates self-assertive versus self-deprecating responses to interpersonal competition. *Child Development, 73,* (6), 1818-1829.

Block by Block: Creative Building Game. (1998). Alexandria, VA: ThinkFun Inc.

Bowlby, J. (1969). *Attachment.* New York: Basic Books.

Butler, J.L., & Baumeister, R.F. (1998). The trouble with friendly faces: Skilled performance with a supportive audience. *Journal of Personality and Social Psychology, 75,* 1213-1230.

Chambers, B., & Abrami, P.C. (1991). The relationship between student team learning outcomes and achievement, causal attributions, and affect. *Journal of Educational Psychology, 83,* (1), 140-146.

Combs, A.W., & Taylor, C. (1952). The effect of the perception of mild degrees of threat on performance. *Journal of Abnormal and Social Psychology, 47,* 420-424.

Deckro, G.R., Ballinger, K.M., Hoyt, M., Wilcher, M., Dusek, J., Myers, P, et al. (2002). The evaluation of a mind/body intervention to reduce psychological distress and perceived stress in college students. *Journal of American College Health, 50,* (6), 281-287.

Deutsch, M. (1962). Cooperation and trust: Some theoretical notes. In M. Jones (Ed.) *Nebraska symposium on motivation.* Lincoln: University of Nebraska Press.

Driskell, J.E., & Salas, E. (1999). Does stress lead to a loss of team perspective? *Group Dynamics: Theory, Research, and Practice, 3,* (4), 291-302.

Driskell, J.E., & Salas, E. (1991). Group decision making under stress. *Journal of Applied Psychology, 76,* 473-478.

Easterbrook, J.A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66,* 183-201.

Eggermont, C. (1997). *The Soma Cube.* Retrieved April 20, 2005 from http://web.inter.nl.net/users/ C.Eggermont/Puzzels/Soma/.

Ellis, A.P.J., Hollenbeck, J.R. and D.R. Ilgen, Porter, C.O.L.H., West, B.J., & Moon, H. (2003). Team learning: Collectively connecting the dots. *Journal of Applied Psychology, 88,* (5), 821-835.

Ellison, C.M., & Boykin, A.W. (1994). Comparing outcomes from differential cooperative and individualistic methods. *Social Behavior and Personality, 22* (1), 91-104.

Elliot, G.R., & Eiseldorfer, C. (1982). *Stress and human health: An analysis and implications of research. A study by the Institute of Medicine, National Academy of Science.* New York: Springer Publishing.

Engleberg, I.N., & Wynn, D.R. (2000). *Working in Groups: Communication Principles and Strategies,* 2nd ed. Houghton Mifflin.

Georgas, J. (1984). Cooperative, competitive and individual problem-solving in sixth grade Greek children. *European Journal of Social Psychology, 15,* 67-77.

Gorman, C. (2002). The science of anxiety: Why do we worry ourselves sick? Because the brain is hardwired for fear, and sometimes it short-circuits. In Annual

Editions: Psychology 04/05 (pp. 176-178). Guilford, Connecticut: McGraw-Hill/Dushkin.

Hansen, J., & Sullivan, B.A. (2003). Assessment of workplace stress: Occupational stress, its consequences, and common causes of teacher stress. (ERIC Document Reproduction Service No. ED480078)

Hare, A.P. (1976). *Handbook of small group research.* 2nd ed. New York: The Free Press.

Hinsz, V.B., Tindale, R.S., & Vollrath, D.A. (1997). Comparing the structure of individual and small group perceptions. *International Journal of Small Group Research, 4,* 159-168.

Innes, L.G., & Allnutt, M.F. (1967). *Performance measurement in unusual environments* (IAM Technical Memorandum No. 298). Farnborough, England: RAF Institute of Aviation Medicine.

Jemmott, J.B., & Locke, S.E. (1984). Psychosocial factors, immunologic mediation, and human susceptibility to infectious disease: How much do we know? *Psychological Bulletin, 95,* 78-108.

Jewett, J., & Peterson, K. (2004). Stress and Young Children. *ERIC Digest.* (Eric Document Reproduction Service No. ED20021201)

Johnson, D.W., & Johnson, R. (1975). *Learning together and alone: Cooperation, competition, and individualization.* Englewood Cliffs, NJ: Prentice Hall.

Johnson, D.W., Skon, L., & Johnson, R. (1980). Effects of cooperative, competitive, and individualistic conditions on children's problem-solving performance. *American Educational Research Journal, 17,* (1), 83-93.

Karasek, R., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life.* New York: Basic Books.

Mathews, K.E., & Canon, L.K. (1975). Environmental noise level as determinant of helping behavior. *Journal of Personality and Social Psychology, 32,* 571-577.

Nastasi, B.K., & Clements, D.H. (1991). Research on cooperative learning: Implications for practice. *School Psychology Review, 20,* (1), 10. 131.

Petress, K. (2004). The benefits of group study. *Education, 4,* (4), 587-589.

Rachman, S.J. (Ed.) (1983). Fear and courage among military bomb-disposal operators [Special issue]. *Advances in Behaviour Research and Therapy, 4,* (3).

Salas, E., Driskell, J.E., & Hughes, S. (1996). Introduction. In E. Salas & J.E. Driskell (Eds.), *Stress and human performance* (pp. 1-45). Mahwah, NJ: Lawrence Erlbaum.

Sameroff, A.J. (2000). Developmental systems and psychopathology. *Development and Psychopathology, 12,* 297-312.

Segerstrom, S.C., & Miller, G.E. (2004). Psychological stress and the human immune system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin, 130,* (4), 601-630.

Slavin, R.E. (1983). When does cooperative learning increase student achievement? *Psychological Bulletin, 94,* 429-445.

Staw, R.M., Sandelands, L.E., & Dutton, J.E. (1981). Threat-rigidity effects in organizational behavior: A multi-level analysis. *Administrative Science Quarterly, 26,* 501-524.

Turner, P.J. (1991). Relations between attachment, gender, and behavior with peers in preschool. *Child Development, 62,* 1475-1488.

Vernette, P., Harper, L., & DiMillo, S. (2004). Cooperative & collaborative learning... with 4-8 year olds: How does research support teachers' practice? *Journal of Instructional Psychology, 31* (2), 130-134.

Wheelan, S.A. (1994). *Group processes: A developmental perspective.* Boston: Allyn and Bacon.

Yamamoto, T. (1984). Human problem solving in a maze using computer graphics under an imaginary condition of "fire." *Japanese Journal of Psychology, 55*, 43-47.

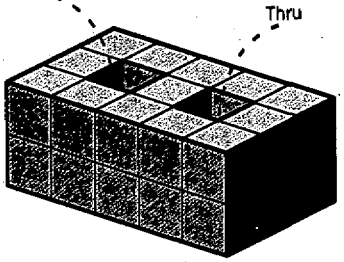
Zegans, L. (1982). Stress and the development of somatic disorders. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (pp. 134-152). New York: Free Press.

APPENDIX A

PUZZLE 1

Block•Block®

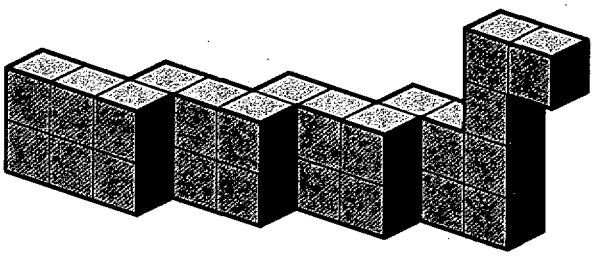
BRICK



PUZZLE 2

Block•Block®

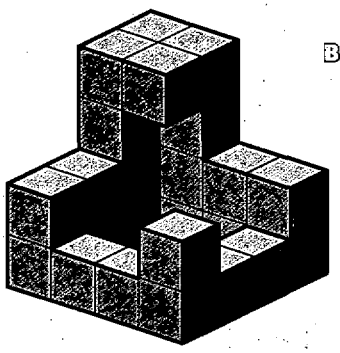
SNAKE



PUZZLE 3

Block•Block®

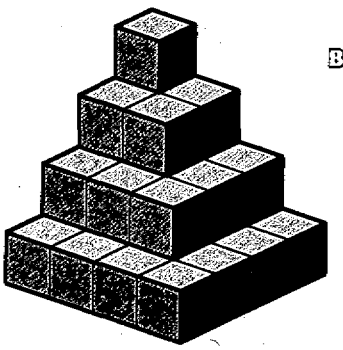
SHOWER BOX



PUZZLE 4

Block•Block®

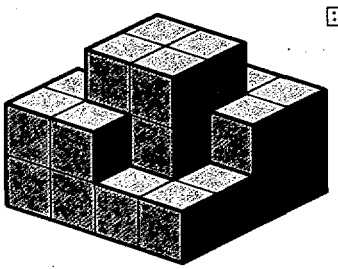
PYRAMID I



Contains three empty spaces

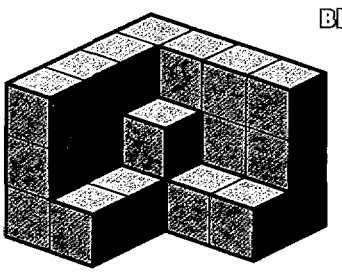
PUZZLE 5

Block•Block®



PUZZLE 6

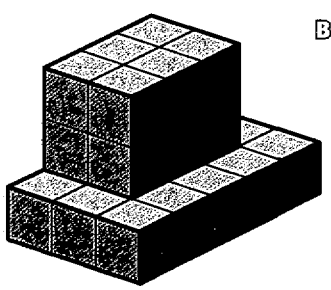
Block•Block®



PUZZLE 7

Block•Block®

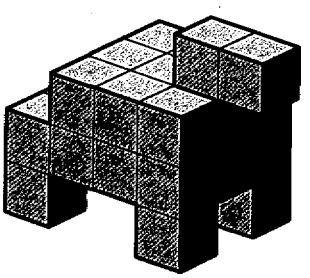
MONUMENT



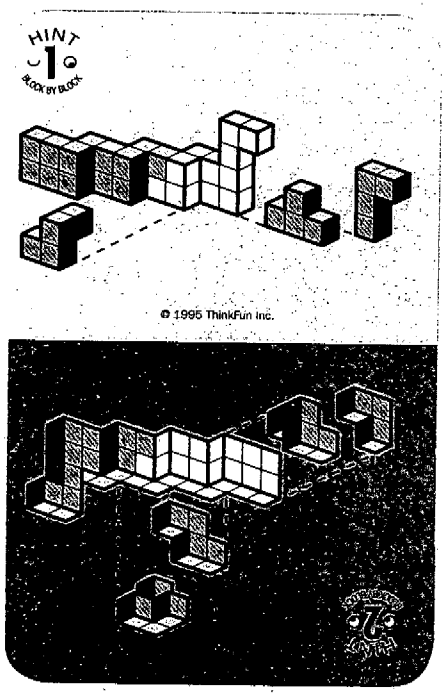
PUZZLE 8

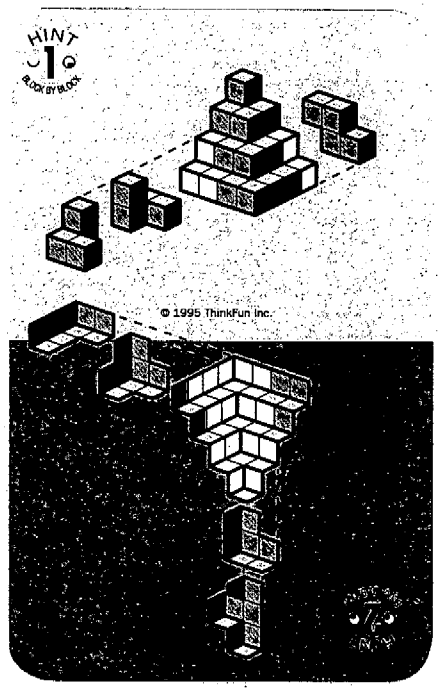
Block•Block®

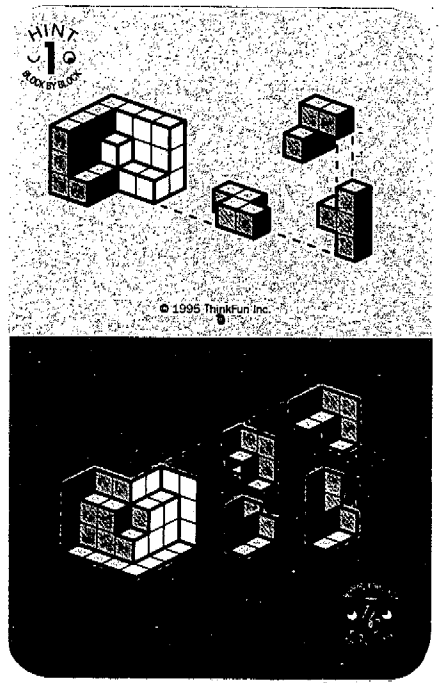
BAD DOG

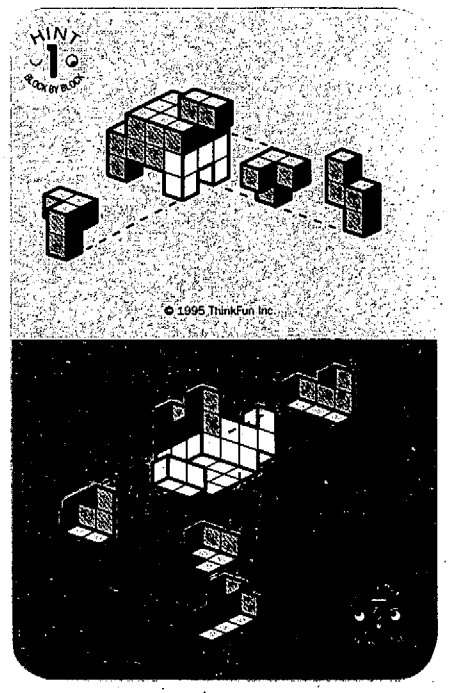


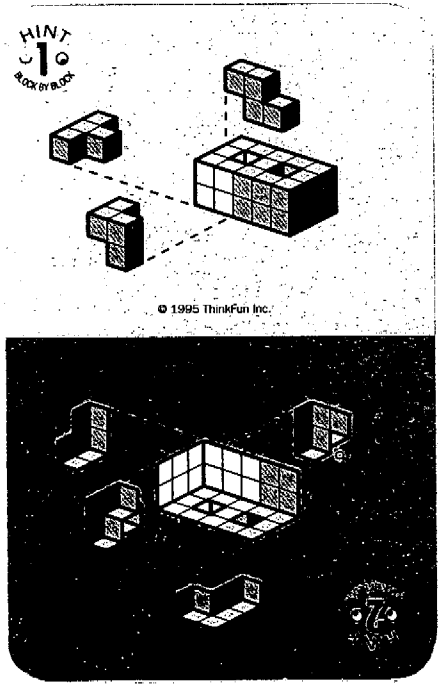
APPENDIX B

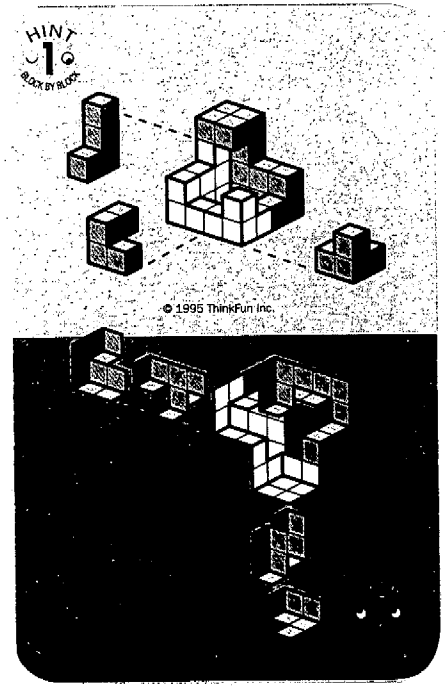

HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.

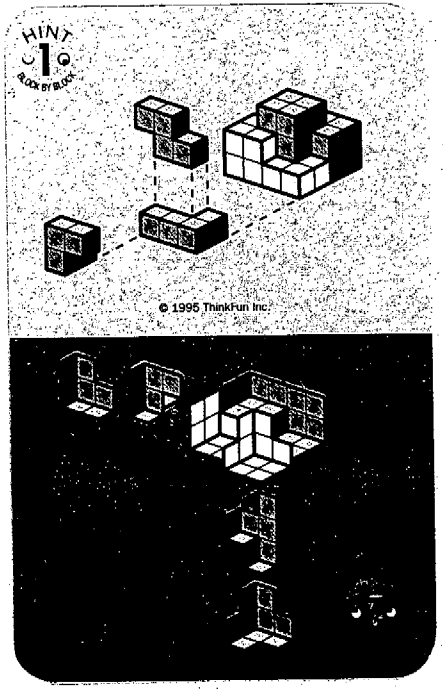

HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.

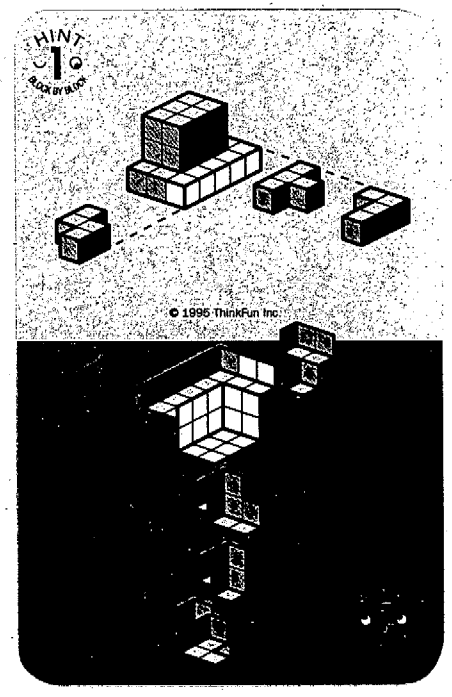

HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.


HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.


HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.


HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.


HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.


HINT
BLOCK BY BLOCK
© 1995 ThinkFun Inc.